hexaazabicyclo[10.7.7]hexacosa-1,11,13,18,20,25-hexene-k^{4}N)cobalt(II)hexafluorophosphate; [N,N'-bis(salicylicylidene)ethylenediamine]cobalt(II); [N,N'-bis(3-methoxysalicylicylidene)ethylenediamine]cobalt(II); [N,N'-bis(salicylicylidene)tetramethylethylenediamine]cobalt(II); [N,N'-bis(3-methoxysalicylicylidene)tetramethylethylenediamine]cobalt(II); [N,N'-bis(3-isoprpoxysalicylicylidene)tetramethylethylenediamine] cobalt(II); [N,N'-bis(3-ethoxysalicylicylidene)tetramethylethylenediamine] cobalt(II); [N,N'-bis(5-methoxysalicylicylidene)tetramethylethylenediamine] cobalt(II); [N,N'-bis(5-n-butoxysalicylicylidene)tetramethylethylenediamine] cobalt(II); [N,N'-bis(salicylidene)ethylenediamine] cobalt(II)); a cobalt(II)porphyrin complex; a metal-cyanide complex encapsulated within a zeolite; a cyanocobaltate; hemoglobin, hemerythrin or hemocyanin containing a diiron(III,IV), dicopper(II) or dimanganese core; N,N'-disalicylideneethylenediamine cobalt(II); cobalt di-(3-methoxysalicylal tertbutylamine); [N,N'-bis(salicylidene)n-propyldipropylenetriamine]cobalt(II); 1-methylimidazole; 2-methylimidazole; 4-dimethylaminopyridine; cyanopyridine; cobalt chelated copolymer derived from ethylenediamine-tetraacetic acid, methyl methacrylate and butyl acrylate; bis(histidine) cobalt(II); [a-mono(o-methacrylamidophenyl)-a,a,a-tris(o-pivalamidophenyl)porphinato]cobalt [meso-a,a,a,a-tetrakis(o-pivalamidophenyl)porphinato]-iron(II); cobalt(II) meso-tetra-phenyl-porphyrin; cobalt(II) meso-tetrakis(2-chlorophenyl)prophyrin; cobalt(II) meso-tetrakis(4-chlorophenyl)porphyrin; cobalt(II) meso-tetrakis(4-methoxy phenyl)porphyrin; cobalt(II) meso-tetrakis(2,4-dimethoxy phenyl)porphyrin; ruthenium (III) bis(salicylaldehyde)ethylenediimine; ruthenium (III) bis-(salicylaldehyde)diethlenetriimine; ruthenium (III) bis(picolinaldehyde)-o-phenylenediimine; ruthenium (III) bis(picolinaldehyde)ethylenediimine; ruthenium (III) bis(picolinaldehyde)diethylenetriimine; bis(dimethylglyoximato)nickel(III); bis(dimethylglyoximato)cobalt(II); bis-(dimethylglyoximato)copper(III); dinitrato-bis(sym-diethylenediamine)cobalt(II); dithiocyanato-bis(sym-diethylethelenediamine)cobalt(II); dichloro-bis(sym-diethylethylenediamine)cobalt(II); cobalt di-(salicylal)-3,3'-diimino-di-n-propylamine; N,N'-disalicyclidene ethylene diamine cobalt (II); N,N'-ethylene-bis(5-nitro-salicylideniminato) cobalt(II), or a combination of two or more thereof.

[0099] The sorption medium may be inorganic. Examples of inorganic sorption mediums that may be used include Sb_2O_5, AgO, PtO, CrO_2, PbO, HgO, Cu_2O, MnO, Mn_2O_3, Bi_2O_4, NiO, NiO_2, Cu_2O_3, SnO, SnO_2, WO_2, WO_3, W_2O_5, perfluororinated film, Pt/g-alumina, Fe/g-alumina, Cu/g-alumina, Zn/g-alumina, Co/g-alumina, zeolite, or a combination of two or more thereof. Included in this group are metal cyanide oligomers and polymers. These include the oligomers and polymers represented by the formulae $[Cu(I)(CN)_x]_n$, $[Fe(II)(CN)_y]_n$, or $[Co(II)(CN)_y]_n$, wherein x is 3; y is 5; and n is a number that is at least 2, and in one embodiment is in the range of about 2 to about 16,500, and in one embodiment about 1000 to about 10,000.

[0100] The sorption medium may comprise silver, gold, platinum, copper, zinc, palladium, nickel, zeolite, silica gel, carbon molecular sieves, polymeric materials, alumina, inorganic complexes (e.g., metal centered porphyrin rings) or a combination of two or more thereof.

[0101] In one embodiment, the sorption medium comprises a reactive complexation sorbent that forms a reversible chemical complex with a fluid component at a relatively high temperature wherein the fluid component is sorbed by the surface of the sorption medium. At a lower temperature the chemical reaction is reversed and the complexed fluid is recovered in a more purified form.

[0102] The sorption medium may comprise an antioxidant. Examples include secondary amines, phenolic phosphates, phosphites, phenolics, bisphenolics, hydroxylamines, olefinic carboxylates, amino carboxylates (e.g., ethylene diamine tetracetic acid and salts thereof), tocopherol, di-tertiarybutyl-p-cresol, stannous salts, stannous oxides, sorbate, polysorbate, or a combination of two or more thereof.

[0103] An advantage of the invention is that the use of a fin structure to support an active sorption medium enables a relatively fast thermal swing. A metallic fin structure may have a thermal conductivity in the range of about 10 to about 20 W/m/K or greater depending on the material selected. Aluminum may exceed 100 W/m/K. On the other hand, the thermal conductivity of a porous medium such as a pellet or powder sorbent bed is typically in the range of about 0.2 to about 2 W/m/K. As a result, the use of a fin supported sorption medium enables faster cycle times due to enhanced heat transfer through the fin versus a porous medium. The difference in cycle time is roughly proportional to the difference in thermal conductivity of the sorption medium. The use of a fin supported sorption medium permits the time for each cycle to be reduced significantly as compared to a porous sorption medium. This enhancement in cycle times facilitates both gas phase and liquid phase sorption separation processes.

EXAMPLE 1

[0104] A steam/methane reforming (SMR) process with integrated combustion on the opposing side of the heat transfer plane is conducted in a microchannel reactor employing an FeCrAlY fin supported SMR catalyst. The use of an SMR catalyst on fins inserted in a process microchannel produces surprisingly high heat fluxes (10 to **141** W/cm^2, low SMR contact times (10 to 0.7 ms), and low SMR pressure drops.

[0105] Except for the FeCrAlY fin which supports the SMR catalyst, the microchannel reactor is constructed of Inconel 617 plates of various thicknesses which are stacked, clamped together, and welded at the perimeter to form a reactor 0.5 by 3.63 inch (12.7 by 92 mm) in footprint by 0.67 inch (17.1 mm) high. All channels for gas flow are machined using conventional techniques except air jet orifices, which are formed via electrode discharge machining (EDM). An air header plate (6.35 mm thick with a 12.7 by 56.5 mm footprint) is welded in a 2.54 mm deep pocket machined into a combustion plate over the air jet orifices. On the face adjacent to the combustion plate is machined an air header channel of dimensions 0.125 inch (3.18 mm) deep by 0.080 inch (2.03 mm) wide by 1.84 inches (46.8 mm) in length. The combustion plate is stacked next to a web plate, which is stacked next to an SMR plate. The SMR plate is divided into three sections which lie in the same plane and are each welded together and to the web plate after stacking. Along the entire 56.7 mm length of the center SMR section (which